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# REPORT

OF THE

# FISH COMMISSIONERS,

OF THE

# STATE OF WEST VIRGINIA.

*FOR THE YEARS 1877-8.*

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# REPORT OF FISH COMMISSIONERS.

*To his Excellency* H. M. MATHEWS,

*Governor of the State of West Virginia:*

The undersigned herewith submit the following report of their operations under the provisions of the act of the Legislature, passed February 20, 1877, entitled "an act to increase the supply of food fishes in the rivers and waters of this State."

On the 17th day of July, 1877, as soon after their appointment as practicable, they met at Berkeley Springs, and organized the Board of Fish Commissioners of West Virginia, by the election of John W. Harris as President, and C S. White as Secretary. John W. Harris was also appointed Treasurer. Believing that an inspection of some establishments for the propagation of fish would be of very great benefit to them in the discharge of their duties, they proceeded to visit the Pennsylvania hatchery, at Donegal Springs, and the Maryland hatchery, at Druid Hill Park. They made a through examination of these establishments, and also of the fish-way in the Susquehanna, at Columbia.

Commissioner White, finding near his home, a large freestone spring, favorably situated, of a temperature never exceeding fifty-six degrees, and one which was never affected by drouth, or colored by rains, and which was possessed of sufficient volume for the successful hatching of any of the salmonidæ, at his own risk purchased the same of C. Harmison, Esq., and also some three and a half acres of land adjoining it, together with all necessary rights and privileges, at a cost for the whole of $700.00. In consequence of the small appropriation at our command, we were unwilling to undertake the building of a hatchery without more reliable estimates of the cost than any we then had, whereupon Commissioner White agreed to build it at his his own expense and give the Commissioners the privilege of taking it off his hands at actual cost. He accordingly secured the presence of Mr. R. Brennen, Superintendent of the Wilcox Trout Pond, of

Pennsylvania, and with Mr. Brennen's assistance and counsel, proceeded to have a hatching-house erected and furnished with all proper appliances for the hatching of fish. One hundred and twenty thousand trout eggs were then procured and hatched with signal success. In hatching these fish, Commissioner White ascertained that no ordinary hand could be entrusted with them; and though different persons were employed, it required his constant presence, over-sight and assistance to prevent the loss of the eggs. For more than one month he was constantly engaged at the hatchery, to the neglect and detriment of his private business. He then succeeded in procuring an expert in fish culture from Pennsylvania.

In December, Major T. B. Ferguson, Commissioner of Fisheries of Maryland, kindly furnished us ten thousand California salmon eggs, which were hatched, and the fry kept and fed in the hatch-house for some time, and then distributed, with a total loss of less than thirty from the time the eggs were placed in the troughs.

In December, another meeting of the Commissioners was held at Lewisburg, and the Commissioners being of opinion that it was essentially necessary to have a hatchery of our own, purchased the one selected by Commissioner White, at the sum of $700.00, the actual cost of construction. At the same time an agreement was entered into with Commissioner White, by which he bound himself to convey to the State, for the benefit and uses of this Commission, one-fourth of an acre of the land upon which the hatch-house is situated, including the springs, together with all the rights and privileges possessed by him as to control of water, use of rock, stone, &c., from adjacent lands, and the right of way over the lands of said Harmison, upon the payment to him, on or before April 1, 1879, of the sum of $550.00, with interest thereon from September 1, 1877, or to convey, at the option of Commissioners, the entire lot of land at the price he paid therefor, and the cost of certain improvements made by him to the value of $50.00. The Commission think it all-important that the land on which the hatchery is situated should be purchased in accordance with said agreement, so that the ownership of the whole establishment may be in the State.

## THE SUBJECT OF FISH CULTURE

Is but little understood amongst our people, and hence its importance is not appreciated to that extent which it deserves. What has been accomplished by fish culture, and the greater results that may be expected in the near future by an intelligent prosecution of the work, appears to be known to but few. In fact, the undersigned, serving without pay, and solely in the interest of the public, have not only met with but little encouragement, but have encountered many obstacles in the prejudices and preconceived opinions of those with whom they have had to deal. It may not be inappropriate, therefore, without entering into details, to give a partial outline of the progress that has been made in the work elsewhere, and what may be reasonably expected from it here.

The abundant supply of fish with which our streams were formerly supplied, is not merely a matter of history, but of fact within the memory of many men now living. We read with some degree of amusement, that it was formerly a custom in England and Scotland for servants to stipulate that they should not be compelled to eat salmon more than twice a week; and that the laws of Connecticut even forbade masters to force them on their servants more than three times a week. Within the recollection of many of our older citizens, shad were plentiful in the upper tributaries of the James river, in Virginia, and it has been estimated that at one time, one-half of the flesh food of the large population dwelling within the region drained by it, was derived from the fish of its waters.

In one of the early histories of Virginia, we find the following in reference to the Potomac river, which runs for more than one hundred miles through our own State, and has large and numerous tributaries within our boarders:

> "It is navigable one hundred and forty miles, and has many sweet rivers and springs which fall from the bordering hills. These hills are, many of them, planted, and yield no less plenty and variety of fruit, than the river exceedeth with abundance of fish. * * * In divers places there was that abundance of fish lying so thick, with their heads above the water, as for want of nets, we attempted to catch them with a frying-pan; but we found it a bad instrument to catch fish with. Neither better fish, more plenty, nor more variety for small fish, had any of us ever seen in any place, so, swimming in the water, but they are not to be caught with frying-pans."

It is not many years since fish were caught by the barrel full and salted down for subsequent use in the Cheat river; and a gentleman now living informs us that he has seen (some forty years since) a two-horse wagon load taken in one morning from that stream near Dunkard Bottom, not far from Kingwood. And this was so, in greater or less degree, with many of our streams.

But this is now all changed. The best of our streams scarcely afford sport for the angler, and no one relies upon them for a supply of food; and until recently, this has been the case for a long time with the streams of nearly all the more populous countries, with the exception of China, where, for a long time, a rude system of fish culture has been practiced, and fish and rice made more to form the staple food of the people. If the only object of fish culture was to afford sport to the angler, an occasional meal to a lazy man, or pleasant recreation to those who might need and enjoy it, it might be doubted whether it deserved the fostering care of the State; but the increase of population and the greater scarcity and cost of flesh food *per capita* now than formerly, presents a problem which may well arrest the attention of intelligent individuals and governments. Even in our own State, sparsely settled as it is, this scarcity is beginning to be felt, and as population increases, it will press more heavily on the people. Wise legislation, looking to the future, will make such provision as is in its power to render available all its resources for the cheap and plentiful supply of healthy food to all the people who are, or may come into the State; and every natural food that is self-sustaining, and does not interfere with the cultivation and utilization of the soil, deserves the attention and protection of the State. It has been estimated that an acre of water can be made to produce twice as much food as an acre of land.

Our streams have the same capacity to support vast quantities of fish that they ever had, and if they can be kept filled with fish as once they were there will be many thousands of dollars worth of the healthiest and most palatable of food added to the resources of every county within our borders—a food that will increase itself without cost, and without interfering with any other means of productiveness. Especially will this be so if the *Anadromous* fishes, such as salmon and shad, can be successfully introduced. The average weight of spawning shad can be put at from three to four pounds; of salmon at from ten to twenty pounds. It costs absolutely nothing to feed these fish. Even of the natural fish food found in our streams, there is no consumption by them except for the period between the time of placing them in the stream, as fry, until they reach the sea, to which their descent generally begins the same year they are hatched. They get their living and make their growth in the boundless ocean, where there is food for untold millions, and return when full grown, fat and delicious, the choicest of food to the places where they were hatched, to deposit their spawn. Even during this return, they eat nothing, leaving the non-migratory fish undisturbed and without any diminution of their food in the stream. They come, provided there is no insurmountable obstacle in the way, in numbers only limited by the number of fry which originally started for the sea, (diminished, of course, by the accidents and diseases to which they are liable,) and the capacity of the stream to contain them.

The scarcity of fish in the streams of populous countries has arisen from various causes. Among these are the pursuit and wanton destruction of all kinds and sizes of them, at all seasons, and by all means, fair and foul; the catching of females on their spawning beds; the wholesale destruction of their eggs by fowls, animals, insects, &c., and the imperfect impregnation of the eggs, when naturally spawned. Observations made at the United States Hatching House, on the McCloud river, show that not more than eight per cent. of the eggs of salmon, naturally spawned, are fertile, (i. e. impregnated.) Other observations have shown that not more than one in a thousand of those impregnated, live to become full-grown fish, if hatched in the natural way. Water fowl of all kinds, muskrats, minks, otters, raccoon, snakes, frogs, lizzards, fish of nearly all kinds, eagerly seek and devour the newly laid spawn, and, in addition, many water insects prey upon it. Dr. Peard states that within his experience, 70,000 salmon eggs deposited in a beautiful clear stream. were devoured in one season by the embryo of the dragon fly. The sediment also held in solution in the water, if it settles upon the eggs, suffocates them, and immense quantities are doubtless, thus destroyed. Another, and more deadly enemy is called Byssus. It is a fungus growth, created by matter decaying in the water. Whenever a fish-egg loses its vitality, and begins to putrify, (which it may do in the coldest water in less than a day,) Byssus begins to grow. It stretches out long, slender, threads over everything within its reach, sometimes embracing as many as twenty eggs, and each one that it touches, receives its death warrant.

With these manifold agencies of destruction at work, it is not wonderful that, although the salmon spawns as high as 20,000 eggs, and the shad 50,000, the fish do not naturally increase faster, especially as for a long time after hatching, the young remain in schools, and are powerless to evade the living enemies which pursue them. But the time came when it was necessary that man should have, and exercise dominion over the fish, and some thirty years ago a French peasant (Remy) discovered the natural process of propagating fish, by which the means of their increase have become indefinitely multiplied. His discovery has led from one step to another in the science of pisciculture, till now the spawn can be artificially taken from the female fish, the melt from the male, the eggs impregnated and transported thousands of miles, the fish hatched from the eggs, and the young fish, at a proper age, to care for themselves, placed in the streams—and all this with a loss, oftentimes, of not more than ten per cent. upon the number of spawn taken from the fish.

In 1853 the first establishment for hatching fish was established at Huningue by the French Government. In 1862, the revenue to

France from her fresh water fisheries, amounted to $4,000,000,00; and now all her streams are well stocked with fishes. Millions of young fish are annually turned into them to keep up the supply.

The great success attending artificial propagation in France, awakened the attention of the various States of Europe to the subject, and within a few years, Switzerland, Russia, Germany, Italy, Spain, Belgium, Holland, Great Britain and Austria followed her lead successfully. The value of their fisheries have since increased greatly. The rentals of one small stream in Great Britain now amount to $100,000.00 annually, and the value of the salmon taken in that country reaches the enormous sum of $5,000,000.00 per year. In Australia, Canada and India fish culture is established and maintained by the Government, and the proceeds of the fisheries in Canada are enormous. They increased nearly $1,000,000.00 from 1876 to 1877.

The operations of the United States Fish Commission began in 1871. Now twenty-six States and one Territory have entered upon the work, and thus far it has been a successful one. A list of these States, with the names of the Commissioners (embracing some of the foremost men in each State) is hereto appended.

Fish culture has been not only a success, but in many instances its results have been truly wonderful. It has been demonstrated that waters hitherto useless can be made more producive than an equal area of land, and with less than one-tenth the labor or cost. As the Virginia Commissioners say in their report: "The discovery of artificial propagation gives man absolute dominion of the waters and their inhabitants. He can multiply these almost indefinitely, subject only to the limitations of a sufficiency of water, and of food in the water, for their subsistance and growth. With respect to anadromous fish, (those which periodically ascend to fresh water, not to feed, but to spawn,) the only limit to their increase is enough water to cover them. These are far the most valuable fishes; for besides being good and fresh they can be salted and preserved, and transported to distant markets.

As in some measure showing what degree of success has already, in this country, attended the propagaiion of anadromus fish, we submit the following extracts from the reports of the Commissioners of other States:

Ohio Report, 1877.—"In 1867 and 1868, many millions of young shad were put into the Connecticut. The following year (1869), no shad were hatched,—it having been deemed advisable to await the result of the experiments already made. But they had not long to wait, for in 1870 the problem was solved—the supply of the fish being so abundant that 'such a run had not been seen in the river for twenty years!' Immense shoals made their appearance in the sound on the

22d of May, making for the Connecticut river. The next morning 28,000 were taken from the nets at or near Saybrook, and from other points reports were received of a similar character, the hauls, in some instances, being seven fold the usual catch. When we add to this that both in size and quality the fish taken were excellent, there was nothing more to be desired. The year 1871 saw a great glut in the market of Saybrook, where they were sold for ten cents apiece, and the old process of salting long discontinued, was again revived. Indeed, it was now no longer a question of scarcity, but of super-abundance, which caused so great a decline in prices as to leave but little profit on the sales."

PENNSYLVANIA REPORT, 1876.—"Repeatedly since the deposits of salmon have been made, and year after year, strange individual fishes have been caught sufficiently resembling what our fish ought to be, to show that these strangers must be stragglers of the deposits which have not made their way to the sea. Fisherman who have caught them, and who in almost all instances, have returned them alive to the water, have said that they resemble brook trout, a branch of the family, *salmon fontinalis*, more than anything else; and this is an extremely favorable evidence that the strange fishes are half-grown Californians." "The reports from the Delaware on this subject are more explicit than we are able to give from the Susquehanna. The Fishery Commissoners of New Jersey believe the deposit in that stream to have been an entire success, only requiring time to devolop it into a series of the most satisfactory returns."

NEW HAMPSHIRE REPORT, 1876-7.—"In the year 1874, young salmon were put in the Merrimac in New Hampshire; that many of these fish and those previously placed in the river have found their way down stream to the sea, andthat they have sought to find their way to their early home is very evident. Young salmon have appeared in unusual numbers in the lower waters of the Merrimac and in the bays along the coast near its mouth. Fish of two or three pounds weight have been taken in gill-nets in Massachusetts bay, and several, weighing eight or nine pounds, were caught in the bays near Boston. The Commissioners of Maine say: Of the young salmon planted by us in the rivers of Maine, those put into the Penobscot in 1874, were seen the following spring (1875), in very large numbers on their way down to the ocean."

"At every incoming tide the little smolts, as the year old salmon are called, would collect in considerable numbers at the foot of the dam at Moorse's Mill, on the Kenduskeag. A good many have been caught there by our city boys. This year, 1876, the river has abounded with them from the branches of the Penobscot to Bangor. Very many have been caught by anglers at the water-works dam at all stages of the tide.

"On the Androscoggin, where the first salmon fry were turned in four years since. at Norway, we have had information every year of more or less being caught, both in the smolt nets and weirs, as well as by boys with hook and line. Grilse, which is the distinctive name given to a salmon on its first return from the sea, (and weighing from one to three pounds,) have been reported to us from time to time; that is to say, we have recognized them from the description of a supposed nondescript fish represented to us as being of the size of a large chub, but with smaller head, slimmer, and longer body, and when cut, the flesh, the color of salmon. The grilse is unknown to our fishermen here, as their nets are of too large a mesh to retain them."

"On the 24th of June, 1876, a fine, healthy salmon, weighing eighteen and one half pounds was taken in a gill net at Midde Haddam, by Thomas Donallan. It was brought to Hartford and exhibited at Steven's market to the great delight of many of our people. On July 6th, 1876, a salmon weighing eleven pounds was caught in a pound off Clinton, and taken to New Haven, where it was exhibited as a great curiosity. It was in excellent condition. Late in February. in the same year, a salmon was caught in the Housatonic river, below Derby, which weighed fourteen and a half pounds, and was in good condition, evidently fresh from the feeding grounds.

"Vague reports have reached the Commissioners that several others were caught, but no satisfactory proof was afforded. Enough, however has been shown to make it certain that the work of restoring salmon to our rivers has progressed so far that it cannot be long before all doubts will be solved. We believe that all indications point to success."

The following extracts show not only the truth of the theories in in regard to the return of *Anadromous* fish to the waters in which they were hatched, for the purpose of spawning, but they also indicate that the salmon and shad may be acclimated in fresh water, and that there is no necessity that they should have access or resort to the sea:

MARYLAND REPORT.—"The past year has been a most important one to the fishing interests, especially as producers, and to the country at large, as consumers of fish, on account of the many indubitable proofs which have accumulated, showing the correctness of the theories on which most of the efforts to re-stock depleted waters with the valuable fishes which were once abundant, but had either entirely disappeared or had become alarmingly scarce, depended for success. On the correctness of these theories depended, also, the success of any effort to stock waters with migratory fishes which before had been unknown to them."

"*The year* 1877 will be noted as adding confirmations so strong that even the hitherto most skeptical can no longer doubt the unerring certainty with which the *Anadromous* fishes (those fishes which move up the rivers to spawn) return, when adult, to the river in which they have spent their minority. That this was the habit of the salmon had been demonstrated both in Europe and in this country, as great numbers had been marked and found to return to the same river year after year; but the experiments had, in a great measure, been confined to rivers or localities in which the salmon had been previously found. During the year just ended we have had many proofs that this instinct is so strong that the salmon will return to rivers in latitudes in which they have never existed prior to their artificial introduction as young fish. Mr. Wilmot, Fishery Officer of the Dominion of Canada, writes me: 'California salmon have visited my establishment this Autumn for breeding purposes.'"

"But to us in Maryland, of more importance is the re-appearance in the Delaware of salmon of *both* varieties, the *Salmo Salar* of the Northern Atlantic coast, and the salmo quinnat of the Pacific. I have received authenticated accounts of the capture of one weighing eight and one-half pounds, at Newcastle; one eight and one-fourth pounds, at Riverton, and one weighing nine pounds, taken between Bordentown and Trenton; and have myself seen a large female Penobscot salmon, with the mature eggs running from her, which was taken near Eaton, in the act of spawning. There have been several others reported, even weighing as high as twenty pounds. These indications of the successful introduction of the salmon into the Delaware, commenced two years prior to the establishment of a Fish Commission in Maryland, strengthens our hopes and confidence in the results of our efforts, as the Delaware is not so unlike our own rivers, and not in so different a latitude, but that we can reasonably expect a like result. More important to us still than the accumulated evidences of the laws which govern the migrations of the salmon are the proofs which have been added during the year, that these laws are as surely applicable to the shad."

"It may be possible to attribute the return in comparatively large numbers, subsequent to artificial propagation, of shad in a river, while in adjacent rivers they continued to decrease, to other causes than the production of a large number of young fish, which without artificial means would have been utterly destroyed. It is impossible however, to account for the sudden appearence of shad in a river in which they had not hitherto existed, but in which young shad, artificially propagated, had been placed on any other theory than that of their return to the waters of their youth impelled by the same instinct which has been so clearly demonstrated as governing the salmon."

"Such unmistakable evidence have we in the capture of several hundred adult white shad (*Alosa Sapidisima*) in the Ohio river last spring, since, prior to their introduction in 1872 by the United States Commissioner, this most valuable fish was unknown to the Mississippi river or any of its tributaries. Add to this the successful introduction of shad into the rivers of the Pacific slope, and we are forced to the conviction that the same laws are applicable to the return of the shad as to the salmon, viz. that they will return, as adults, ,to the waters in which they are placed when young. On page 22 of the report of the Commissioners of Fisheries of the State of California, for 1876 and 1877, they say: 'Shad, in their season, are becoming quite numerous in the Sacramento river. The experiment of their importation to this coast has resulted satisfactorily. The river is of proper temperature, and furnishes an abundance of food for the young fish, before they go to the ocean. There can be no doubt that the first shad brought from the Hudson river in 1871, have been to the ocean, returned and spawned. We would add that these Commissioners have also been furnished with several well authenticated instances of the capture of shad in the Kanawha and in the Ohio, near Huntington. The Maryland Commissoner continued:

The introduction of shad into the rivers flowing into the Great Lakes, has also proved as compleately successful, although it was feared that they could not find in the fresh waters of the Lakes conditions as suitable as in the salt water of their accustomed abode in the Atlantic. During the past season many large specimens, weighing as much as five and a half pounds, were taken in the tributaries of Lake Ontario. The dates of the original deposits of the young fish in the waters in which they had hitherto been unknown, and the times of their subsequent re-appearence as adults, give us some evidence, also of the probable growth of this variety of fish. In these instances of the successful introduction of shad in California, in the Ohio, and in the Great Lakes the first deposits having been made in 1871-2 and 1873, respectively, indicate with the shad, at least that they do not return from the sea in numbers as adults before the 4th, 5th, or perhaps the 6th year."

NEW. YORK REPORT, 1877—"Shad of good size are being frequently caught in Lake Ontario, mostly at the foot of the lake, but occasionally off the mouth of the Genessee river and Sodus Bay. One of the finest of the specimens, yet seen was caught off Sackett's harbor about September 20, 1877 and was sent to Mr. Seth Green, for examination. It weighed five pounds, and measured twenty-six inches in length.

"We occasionally hear from the California salmon. The largest which has come to our notice was sent to Mr. Green about November 27, 1877, from Cayuga Lake. It was picked up on the shore of the Lake with a Lamprey eel attached to it. When found, it was nearly dead. It was a female and weighed three pounds, and measured twenty-two inches in length."

The results of other experiments might be given, but these will serve as illustrations. Prof. Baird, writing to one of our number says: "The California salmon can be land-locked in rivers, even when access to the sea is not possible."

### FISH WAYS.

There is another difficulty in the way of introducing anadromous fish into the waters of our State, to which we have not as yet adverted, viz: High falls and dams in the streams.

It is true that a salmon can leap over a fall of considerable height, indeed they have been known to surmount falls ten or twelve feet high in this way, but these instances are exceptional, and cannot be expected of fish burdened with eggs, and such heights are utterly impassable to a shad.

A remedy is found in the salmon ladder or fish way. These are of various kinds. One of the simplest is a chute or trough of stone or wood, placed suitably in the fall, across the trough at intervals (leaving narrow spaces on each side alternately, wide enough for the fish to pass easily through) are steps or barriers to break the force of the water, forms pools or eddies, and serve as resting places for the fish. Thus, instead of one fall of say twenty feet, the fish has seven to twenty falls of from one to three feet each to surmount, with a resting place at the foot of each. The New Hampshire Commissioners say:

"People unacquainted with the habits of migratory fish ridicule the idea that salmon or other large fishes would pass through a fish way in numbers sufficient to replenish the rivers and lakes above. In the report of our (New Hampshire) Commissioners for 1870, it is stated that on the Galway, an Irish river, more than 40,000 (forty thousand) salmon pass through a fish way, the opening at the top of which is only two feet wide."

As an illustration of the value of fish ways, it is well known that one of the most successful fisheries of Ireland was created by their use. At Balysadare, in the county of Sligo, there are two rivers which join each other—the Arrow and the Owenmare. At the mouth of these two rivers, close to the sea, is a lofty, precipitous fall thirty feet high, and not far from the first are two others, which are entirely impassable to Salmon. The rivers were, consequently, formerly destitute of fish. Mr. Cooper, of Makrea Castle, caused salmon ladders to be placed at the falls, and the rivers to be stocked with salmon. The fish descended, returned and passed up over the ladders. As Mr. Cooper describes it, "the ladder resembled the course of a steeple-chase—four or five salmon often being seen to leap up the same step simultaneously." The result is that the fishery of these rivers, which was formerly valueless, is now worth many thousands of dollars per annum, and an industry is planted where none existed before.

We make the following extracts from reports of Commissioners in reference to fish ways in the United States, viz:

FROM VIRGINIA REPORT, 1877.—*Letter From Massachusetts Commissioner of Fishes.* DEAR SIR:—I have your favor of the 10th. A fish way that would carry shad over a *high* dam *with certainty* has always been a desideratum. I am not prepared to say we have, or have *not* got it. Both at Lawrence and Holyoke dams (twenty-six and thirty feet high) we have excellent fish ways that a shad can easily go over; that is, if a shad be put in the bottom box, he will *easily* pass up and over. Furthermore, large numbers have *voluntarily* gone over. Abundance of alewives passed over these fish ways, and this year, for the *first* time, large numbers of salmon, *the product of artificial planting*, came up the Merrimac and immediately went over all the ways. They were fish of from eight to fifteen pounds; yet they found the narrow mouth of the fish way and entered it."

We do not think West Virginia has any falls twenty-five feet in height.

FROM THE VERMONT REPORT OF 1877-78.—"In 1877—the year in which the return of the first adult salmon of *plantings* made below Holyoke in 1872 and 1873 was expected—about a dozen, weighing from nine to eighteen pounds each, were taken in the Connecticut river, below Portland. During the present year over a hundred were known to have been killed. Early in the season several passed the mouth of the fish way at Holyoke (which debouches so far below the falls, and in such a manner as not to be easily found), and made the most desperate efforts to scale the dam (thirty feet high). An eye-witness to the struggles of one large salmon, reports that in one of his most resolute dashes he almost attained the crest (the apron serving somewhat the purpose of a fish pass), and that had it been in time of high water he might possibly have gone over. On the Merrimac the re-stocking of that river and its tributaries is proving a very great success. The fish way over the dam at Lawrence is proving very perfectly adapted to its purposes. Alewives and lamper-eels have ascended in vast numbers. Last year (1876) forty-seven adult salmon were found in the fish way, during an examination of thirty minutes a day, for twenty-eight days; and it was estimated that during the season over 1,100 adult salmon passed up."

We quote also from a letter from Professor Baird to one of our number, dated August 23rd, 1877: "The Fish Commissioners of New Hampshire had in vain asked of the Legislature means to erect hatching-houses and fish ways. But this year the salmon made their appearance in large numbers below the dam, while the Legislature was in session, and such was the enthusiasm excited by the fact, that a large sum was voted by *acclamation*."

The Pennsylvania Commissioners say in their report of 1877: "Even last year, when the run of shad in the Susquehanna was very much below the average, some five or six hundred shad were caught many miles above our fish way."

### AS TO THE ADAPTABILITY OF OUR STREAMS TO SHAD AND SALMON.

No purer, clearer streams can be found. So far as shad are concerned, the fact that they are found in waters far to the south and far to the north of us, is, it seems, conclusive that the temperature of our waters will suit them. All the information we can obtain from others, and from our own observations and experiments, satisfies us that our streams are, in temperature, also, admirably adapted to the California salmon, and we are inclined to believe that other varieties of salmonidae will do well in them.

In reference to the temperature suitable to the California salmon, and the success attending the efforts lately made to introduce it into the waters of States immediately north and south of us, we have the following statements in addition to those heretofore given:

In the report of the United States Fish Commissoner, 1875, it is stated that,

"The California salmon is a fish which promises a brilliant future to the world, from its rapid growth and its ability to resist extreme heat and cold. A salmon that is not materially inconvenienced by water having a temperature of eighty and eighty-five degrees Fahrenheit, is somewhat of an acquisition, as it can be introduced into waters where *salmo salar* would perish very quickly. In many instances where, in our ponds in the Eastern States, we have had the young of both species together. a sudden rise of temperature has destroyed, at once, all the *salmo salar*, (Eastern or Atlantic salmon,) leaving the California salmon in excellent health."

FROM THE MARYLAND REPORT, JANUARY, 1878: "The following information, given by the California Commissioners, is of great importance, and answers the oft-repeated question, 'will the salmon be able to live in our warm waters?' The statistics hereafter given of the temperature of the water through which the Sacramento and San Joaquin salmon pass to reach their spawning grounds show that they swim for hundreds of miles through the *second hottest* valley in the United States, during the *hottest portion* of the year, where the mean temperature of the air is 92° Fahrenheit, and of the water, 75°. These statistics are of importance as showing that the Sacramento salmon will enter rivers for spawning purposes, where water is so warm that the Eastern salmon, (*salmo salar,*) if it were to meet it, would turn back to the ocean. They are of importance also as illustrating the probability that there are many streams on the Atlantic coast from the *Potomac to the Rio Grande*, into which this fish could be successfully introduced."

The salmon occupies a prominent place among the fishes which furnish largely a healthy food for mankind, and add materially to the wealth of any country producing them, is shown by the following statistics of the yield of two rivers alone. They do no not include the catch at Tehama or Feather river, the fish taken on the upper waters of the rivers, nor the salmon brought to market by fishermen in their own boats; hence, to the totals should be added at least twenty-five per cent., to show an approximation of the actual catch.

### A STATEMENT

of salmon transported from stations on Sacramento and San Joaquin rivers to San Francisco and Sacramento, from November 1st, 1875 to August 1st, 1876:

*To San Francisco.*

| | |
|---|---|
| 127,843 loose salmon, weighing | 3,196,075 lbs |
| 2,433 boxes of salmon, weighing | 486,030 " |
| 3,118 sacks and baskets, weighing | 311,800 " |
| 158 barrels salmon (cured) weighing | 31,600 " |
| 512 barrels and boxes (dried) weighing | 102,644 " |
| Total weight of salmon | 4,128,149 lbs |

*To Sacramento.*

| | |
|---|---|
| 1,116 loose salmon weighing | 29,150 lbs |
| 106 baskets and sacks of salmon, weighing | 10,600 " |
| 53 barrels of salmon, weighing | 12,850 " |
| 414 boxes of salmon, weighing | 57,440 " |

*To Stockton.*

| | |
|---|---|
| 70 loose salmon, weighing | 1,750 lbs |
| 46 boxes of salmon, weighing | 9,200 " |
| Total weight of salmon | 4,249,139 lbs |

From November 1st, 1876 to August 1st, 1877:

*To San Francisco.*

| | | |
|---|---|---|
| 143,998 loose salmon weighing | 3,599,950 | lbs |
| 1,903 boxes of salmon, weighing | 384,300 | “ |
| 3,454 sacks, &c , of salmon, weighing | 345,400 | “ |
| 128 barrels salmon (cured), weighing | 25,600 | “ |
| 653 barrels salmon (dried), weighing. | 132,788 | “ |
| 8,542 boxes salmon (canned), weighing. | 546,688 | “ |

*To Sacramento and Stockton.*

| | | |
|---|---|---|
| 1,617 loose salmon, weighing | 40,425 | lbs |
| 208 baskets of salmon, weighing | 20,800 | “ |
| 414 boxes of “ “ | 86,950 | “ |
| 47 barrels of “ “ | 11,950 | “ |
| Total weight of salmon | 5,194,851 | lbs |

“Add the twenty-five per cent. to the totals in the above tables, and they show the catch from November 1st, 1875, to August 1st, 1876, to be five millions, three hundred and eleven thousand, four hundred and twenty-three pounds; and from November 1st, 1876, to August 1st, 1877, six millions, four hundred and ninety-three thousand, five hundred and sixty-three pounds. This shows a gain of more than a million of pounds in the legal catch over any year since the organization of the Commission. We have no means of ascertaining the weight of fish taken out of season, but estimate that between August 1st, and November 1st, of this year, not less than two millions pounds were taken in defiance of law.”

From Virginia Report, 1877.—“It is no longer deemed a problem that the California salmon will flourish in our waters and return, by instinct, to the stream in which they spent their infancy. Several have been caught in the Delaware and Susquehanna (the first streams in which they were placed), weighing from ten to fifteen pounds. In May last, one fish, weighing four pounds, was caught in the James river, at Bosher's dam, nine miles above Richmond.

“Of the large number of these fish placed in the James river by the Commission in the winter of 1875-6, we hear that early in April last several were caught, nine or ten inches long, twelve miles above Norfolk. They were said to be moving in a solid column, and with great rapidity oceanward, and only the few that fell out of line were captured in fyke nets.”

It may be added that the California salmon has been acclimated in New Zealand and Australia, and that consignments of eggs have been made to Europe and Japan.

## LOCAL FISH.

### *Black Bass.*

There are several varieties of local fish inhabiting the waters of this State which are of considerable value. The black bass (*Micropterus Pallidus*), a very valuable game and pan fish, is found in considerable numbers in the waters both of the East and the West. It is indigenous in the West; it was transplanted to the East. As illustrating the ease with which streams may be stocked with new varieties, as also the habits of this fish—which, by its pugnacious disposition and care of its spawn and young, is one of the most prolific varieties—it is known to many that a few years anterior to the war, General W. W. Shriver, of Wheeling, took from the Ohio, in a locomotive tank, to Cumberland, Maryland, a few black bass and placed them in the canal at the latter point. These few grew and increased so rapidly that, not merely the Potomac, but all its tributaries, became, in a few years, amongst the best bass streams in the country. As will be seen from the table of distributions of fish made by us, a considerable number of this fish has been placed in the waters of New and Greenbrier rivers—the Falls of Kanawha and Richmond and the falls on New river having presented an insurmountable barrier to their ascent from the Kanawha, where they are found in considerable numbers. The progeny of these have made their apppearance, the older fish have been seen on several occasions, and it is confidently expected that the result of the experiment in the Potomac will be repeated in these waters. Thus far it has been found impracticable to hatch the black bass by artificial means, owing to the adhesive nature of the eggs, and it has been necessary when stocking streams to transplant them.

### *Jack and White Salmon.*

The pike-perch, locally known as white salmon of the Ohio, and Wall eyed pike (*S Salmoneum*) and the Jack or yellow salmon of the Ohio (Lucio-perca Canadenisis) are considered the finest of our native pan fishes, and the flavor of those caught in the Ohio river and its tributaries, is considered much finer than that of the same variety which comes to us from Lake Erie. These fish, which in former years were found in great abundance, have now become quite scarce. We therefore made considerable effort last spring to test the feasibility of propagating them artificially, but failed, owing to the sickness of Commissioner Miller, (who had charge of the undertaking) at the time when the fish were ready to spawn. We desire to mention, in this connection, the kindness of Mr. Bartlett, of Parkersburg, who tendered us the use of his fine ponds, abundantly supplied with cold, clear water, and secured for our use a sufficient number of mature fish.

The hatching boxes constructed for this experiment have been sent to the State hatchery at Romney, and we purpose taking a number of mature fish from the Ohio river, to that place and again attempting to propagate them.

### *Brook Trout.*

The well-known brook trout (*salmo fantinalis*) is found in almost every part of the State, and only needs protection in order to abound.

Many streams, however, have been stripped of them by the remorselessness with which they have been fished, and need restocking. We have already begun this, and have distributed a large number of fry. The Legislature, however, should not merely prescribe a close season for this, as for all other fish, but should also limit the taking of trout to rod and line. Our facilities for their propagation will be hereafter much increased and our hatchery will be able to turn out a great many fry at small cost. It would be well if the Commissioners were authorized to give them in such numbers as could be spared, to such persons as would bear the cost of transportation from the hatchery, and would make a proper disposition of them. And the same is true of any other varieties that they may have. It would tend to increase greatly the public interest in fish culture, and propagate a knowledge of the subject. This course has been pursued in several of our sister States with good results.

Although much may be accomplished with our local fish, we mus look chiefly to the anadromus, or sea-going fish, for any large int crease in the food supply. We were, at one time, apprehensive that our distance from the sea on the west of the Allegheny chain was too great to accomplish much with them in that quarter; but in a consultation upon the subject had with that eminent scientist, Prof. Spencer F. Baird, we have been greatly reassured. Amongst the instances given of the ascent of long streams by the shad, which is a less vigorous fish than the salmon, is that of the Yang-tse-kiang, which, it is said, they ascend for the distance of three or four thousand miles.

In order to complete success with these, however, fish ways must be provided over the obstructions in the Potomac, Kanawha, Tygart's Valley and New rivers particularly. The attention of our sister States, Maryland and Virginia, has been, for some time, turned to the obstructions in the former stream, and we may reasonably look to them for joint action with us for their removal. Virginia is likewise interested in the removal of the obstructions in Kanawha and New rivers; but these are not so serious but that we may well undertake their removal on our own account. They consist of the Kanawha Falls, at the confluence of the New and Gauley rivers, and Richmond's Falls, a few miles below the confluence of the New and Greenbrier rivers. A personal examination of these has satisfied us that these obstructions can be removed sufficiently for the passage of fish, at a very small cost, and without injury to the water-power at those points. The removal of these would be of advantage, not merely to the sections of our State lying above them, but would enure equally, if not in greater degree to those below, in that it would open up, in the head waters of those streams, the very best of spawning grounds.

Since the above was written, the following letter has been received by Commissioner White from Major T. B. Ferguson,, the Maryland Commissioner:

"In reply to your inquiry as to the prospects of a fish way over the Falls of the Potomac, Col. McDonald, the Commissioner of Virginia, takes much interest in the matter, and proposes to ask an appropriation from Congress for that purpose. I am sorry that action was not taken in the Forty-fourth Congress. As the matter now stands in the Senate, it was referred to the Committee on Commerce and Navigation, and that committee referred the matter to a subordinate committee. This committee applied to Professor Baird for information. He made a report strongly urging the construction of a ladder over the falls, showing the interest that the four States, Pennsylvania, West Virginia, Virginia and Maryland, had in the matter; *and also the importance of making the Potomac a National river which, when once thoroughly stocked, with salmon, would furnish a supply to all other rivers of the Atlantic coast.*

"I think that, with active co-operation of the members of Congress from these four States, a sufficient appropriation may be secured from Congress. This matter is of great importance, not only for the return of salmon with which the river and its tributaries have been stocked, but also to enable the native fish to ascend the river."

### THE EUROPEAN CARP.

As the introduction of the carp—one of the finest and most delicate of food fishes—is proposed in our operations of next year, we have condensed the following from Prof. Rudolph Hessel's communication to Prof. Baird, as published in the U. S. Reports, 1875-6:

The European carp has a toothless mouth, is of a dark olive brown on back and sides, and resembles the buffalo fish in coat or scales, but is greatly superior to it in the quality of its flesh. This carp will sometimes cross with some related species of the *Cyprinidæ*, and, in consequence, hybrids have been produced which sometimes resemble the genuine carp so much that it is difficult for fishermen or the professed pisciculturist to recognize them. Such fishes are almost valueless as food, on account of their bad and very bony flesh. The carp was originally introduced into Europe from Central Asia, is now common in its rivers, and has been domesticated in many places. The Turkish carp differs from the European varieties in having few or no scales, and is considered a finer fish.

The carp prefers stagnant waters, or those of moderate current, with a loamy bottom, and deep places covered with vegetation. It will live in salt water even. The great advantage of the carp is, that it can live in water where other fish cannot exist; for instance. in the pools of bogs, meadows or sloughs. It lives on vegetable food and worms, and the larvae of acquatic insects, which it turns up from the mud with its head. It likes, above everything else, vegetable matter, not merely of the kinds found in the waters it inhabits, but such as cabbage, lettuce, boiled potatoes, corn, turnips, pumpkins, mellons, &c. The refuse from the kitchen, breweries and distilleries is also very good food for it. The usual weight to which the fish grows in three years, is three to three and one half pounds; but if it have plenty of food, it will grow much more rapidly. It lives to a great age, growing often to the weight of thirty pounds or more. The abundance of eggs in a carp is very great. and hence the fish increase with extraordinary rapidity. A breeding fish weighing from four to five pounds, contains about a half million eggs.

We introduce into our rivers migrating fish, such as salmon and shad, and find it profitable, for the reason that they consume but little food in the rivers, growing up in the sea, and ascending the river, simply to spawn. The carp, as has been said, lives upon vegetable food, insects and worms, and never attacks other fishes or their spawn. Apart from their own value, their fecundity and rapidity of growth, would make them valuable as food for trout, bass, and other predacious fish.

From these considerations, the culture of carp, both in our public streams and in private ponds, seems very desirable. Let it be kept in mind that the ponds can be supplied by almost any water, (indeed, in Europe many of them are supplied by rains only,) whilst the fish is so prolific that a pond, in one or two years, can be overstocked from the increase of one or two pairs of them. An acre of water is sufficient for from eight hundred to one thousand breeding carp of, say, five pounds each. Almost any farmer can have his pond near his house, feed his fish upon refuse vegetables, and have always at his command this additional supply of wholesome and delicious food without cost, and with but little labor. In Europe many thousand acres of artificial waters are to be found, in which enormous quantities of carp are bred, both for home use and the market, in which latter they command a higher price than any fish except trout or salmon.

Prof. Hessel says. "In conclusion, I earnestly recommend the culture of the carp to all pisciculturists. If the value of the carp for table use has once been recognized, it will become a highly esteemed fish, especially in the neighborhood of large cities, and its culture will yield a larger and more certain profit than the expensive trout."

### *Operations at the Hatchery.*

Below is a statement of eggs hatched from the 1st November, 1877, up to 1st December, 1878:

| | Eggs secured | Hatched, |
|---|---|---|
| *Trout received, November, 1877 | 120,000 | 100,000 |
| California Salmon received, December, 1877 | 10,000 | 9,975 |
| †Land-Locked Salmon received, January, 1878 | 10,000 | 8,500 |
| California Salmon received | 525,000 | 500,000 |
| | 665,000 | 618,475 |

---

*Of the trout. a large per cent. were lost during the great fresh of 1877, and some of the young trout were stolen.

†The Land-locked salmon eggs were in very bad condition when received.

### *Distribution–Trout.*

| | |
|---|---|
| Commissioner Harris | 11,000 |
| Big Meadow Greek | 8,000 |
| Tributaries of North river | 4,000 |
| Gap run | 3,000 |
| Tributaries of Capon | 2,000 |
| Mills creek and run | 2,500 |
| Town run | 1,000 |
| Trout run | 6,000 |
| | 37,500 |

### *Trout, Land-Locked Salmon and California Salmon Mixed.*

| | |
|---|---|
| Dillons run | 6,300 |
| Mill creek | 2,300 |
| Preston county | 5,800 |
| Cheat | 6,600 |
| Tygarts Valley | 10,000 |
| Private individuals | 2,000 |
| Mill run, near Romney | 8,000 |
| | 41,000 |

### *Land-Locked Salmon.*

| | |
|---|---|
| Commissioner Miller | 5,000 |

### *Trout and Land-Locked Salmon, Mixed.*

| | |
|---|---|
| Parkersburg | 250 |
| Dents run | 200 |
| Meadow run | 200 |
| Branches of Buffalo creek | 100 |
| Prichard's run | 200 |
| Buffalo Creek | 100 |
| | 1,050 |

### *Trout and California Salmon Mixed.*

| | |
|---|---|
| Tributaries of South Branch | 7,000 |
| Limestone | 2,000 |
| New Creek | 2,000 |
| Total | 11,000 |

### *California Salmon.*

| | |
|---|---|
| Tributaries of Potomac | 40,000 |
| " " " | 20,000 |
| Commissioner Harris | 9,975 |
| " " | 200,000 |
| Commissioner Miller | 250,500 |
| In Hatchery | 49,500 |
| Total | 569,975 |

Making a total of about 556,000 fish hatched and sent from the hatchery, to be put into the streams, and about 50,000 yet in the hatchery, to be distributed, besides eggs yet to be hatched. In addition to these, Commissioner White placed in the tributaries of the Potomac in March last, 40,000; and on the 3d of December, 1878, ten cans more of California salmon, estimated at 20,000, furnished by Major T. B. Ferguson, of the Maryland Commission. And he is also indebted to Major Ferguson for other salmon furnished last winter, and many acts of encouragement and aid.

We have now in the hatching troughs 35,000 trout eggs and 10,000 salmon eggs.

Of the fish put in Cheat and Tygart's Valley rivers, we have no report since early in the summer. It is different, however, with the fish put into the tributaries of the Potomac. Reports from the trout placed in several of the smaller streams show that they lived through the summer and grew rapidly; and we have no doubt that these streams are well and permanently stocked, if the fish are only permitted to live and spawn and get thoroughly established. Of the California salmon, many specimens have been taken in different streams and at different times during the summer and early fall, ranging according to the time of taking, from two inches to four and five inches in length—the largest we have heard of having been taken by a party of gentlemen from Wheeling, who were fishing in the South Branch, in October, and the next largest in Patterson's Creek, by a young son of Rev. M. W. Woodworth. The young salmon were often seen during the summer. The last information we have of them is contained in a letter from H. E. Rockwell, Esq., Secretary U. S. Fish Commission, to Commissioner White, dated October 25th, containing the information that there were two companies from Maryland and one from this State engaged in taking fish in traps in the Potomac, and that "among them many young salmon were captured," and asking that "steps be taken to protect the young salmon."

A few young were kept in ponds at the hatchery, and are growing rapidly. In the pond at the Deaf and Dumb Asylum is a salmon, placed there two years or more since, which is now about fifteen inches in length.

### DISTRIBUTION IN THIRD CONGRESSIONAL DISTRICT.

#### *Trout.*

| | |
|---|---|
| Howard's Creek | 6,000 |
| Tributaries of Greenbrier and New Rivers | 5.000 |

#### *Black Bass.*

| | |
|---|---|
| Greenbrier River, near Ronceverte, two plantings<br>(These were principally large fish, spawners ) | 205 |
| Greenbrier River, near Caldwell | 500 |
| Greenbrier River, near Talcott, spawners | 43 |
| New River, above Hinton, spawners | 40 |
| New River, below Richmond's Falls | 400 |

#### *California Salmon.*

| | |
|---|---|
| Greenbrier River, near Ronceverte, two plantings | 63,000 |
| Greenbrier River, near Caldwell | 88'000 |
| Kanawha River, above Charleston | 60,000 |
| Sinking Creek | 2,000 |

A good many of these salmon, especially those sent to the Kanawha, died *in transitu*, in consequence of the freezing of the cans. These accidents, however, are inevitable, as it is not always possible to have the best attention paid to the fish during transit, and when the distance to be transported is great, as in these cases, the best care will not prevent losses.

These fish were placed in the Greenbrier principally, for the reason that it was more accessible and because it furnished the most desirable rearing ground. However, as there is direct communication between this stream and nearly all the other waters of the district, the other counties will ultimately share in the benefit to be expected from them.

It is proper to add in this connection that Col. Marshall McDonald, the Virginia Commissioner, informed one of our number in a recent letter that he had placed a good many bass and about forty thousand land-locked salmon in the waters of New river, within the boundaries of his State.

### DISTRIBUTION IN THE FIRST CONGRESSIONAL DISTRICT.

### *California Salmon.*

| | |
|---|---|
| Fish Creek, at Littleton, in December, 1877 | 3,300 |
| Middle Island Creek at West Union in December, 1877 | 3,300 |
| Wheeling Creek at Sheppard's farm in December, 1877 | 3,400 |
| Middle Island Creek at West Union in Novembee, 1878 | 25,000 |
| Hughes' River, near Pennsboro, in November, 1878. | 25,000 |
| West fork of Mononghela River at Walkersville in November, 1878 | 25,000 |
| Little Kanawha River at Ewing's mill in November, 1878 | 25,000 |
| Fishing Creek, twelve miles from Mannington, December, 1878 | 37,500 |
| Fish Creek, Littleton, December, 1878 | 37,500 |
| Wheeling Creek near Cold Spring in December, 1878 | 25,000 |
| Buffalo Creek near Bethany in December, 1878. | 25,000 |
| King's Creek near Fairview December, 1878 | 25,000 |
| Total | 260,000 |

### *Land Locked Salmon.*

| | |
|---|---|
| Fishing Creek, twelve miles from Mannington, February, 1878 | 5,000 |
| Buffalo Creek near Wellsburg January, 1878 | 3,000 |

(This shipment, when started from Hatchery at Wilcox, Pa., consisted of 4,500 fry, but owing to the extreme hot weather and impure ice, one-third was lost before reaching our waters.)

We have reason to expect the finest results from the "Schoodic" or Land Locked Salmon placed in Fishing Creek, for we succeeded in keeping one of this lot alive, during the past hot summer in a small acquarium supplied with Ohio river water.

In the last report of the Fish Commissioner of the State of Ohio, we find much complaint of the obstacles encountered by them in the propagation of migratory fish growing, out of the alleged fact that citizens of Kentucky and West Virginia were in the habit of stretching seines across the mouths of the Ohio streams, "purposely to prevent them from ascending." We also find the matter referred to by Governor Young in his message to the Legislature in the following terms:

> Mr. John H. Klippart. Secretary of the State Commission of Fisheries, imforms us officially that complaints have been made by many citizens of Ohio to the State Commissioners of Fisheries, to the effect that the parties resident of West Virginia and of Kentucky habitually place seines across the mouths or outlets of Ohio streams near the Ohio

side, in the season of the year when migratory fishes are seeking the mouths of streams flowing into the Ohio river, thus preventing migratory fishes from ascending and depositing their their spawn to re-stock said streams with desirable food fishes. Many thousands of fry or young fishes of the salmon and shad families have been deposited in the Muskingum, Scioto, and Miami rivers, by order of the Commissioners, during the past three years. These are well-known migratory species, and it is claimed that by the interposition of West Virginians and Kentuckians the mature or adult fish are deprived of free access to the Ohio streams, and the work of the Commission, is to a great extent, rendered nugatory so far as benefiting the State of Ohio is concerned, but that the result of their labors inures to the benefit of West Virginia and Kentucky.

It is not charged that the residents of these States have, by their conduct, violated any law, for it is claimed for them, and the claim has been admitted as valid by the Supreme Court of Ohio in the case of *Booth* v. *Hubbard*, 8 O. S. R., page 243, that the boundary line of the State of Ohio, dividing us from these States, is low-water mark on the Ohio side.

The Commission of Fisheries are very confident of their ability to stock our streams with the best of food fishes, provided there are no undue interpositions.

Much space is also devoted, by the Ohio Commissioners, to the discussion of the boundary line of the States of Ohio and West Virginia as affecting the matter. Without entering into that question, inter-State comity alone would suggest the application of all the means in, our power to correct the injuries complained of, and we hope that the matter may receive proper attention at hands of those with whom the remedy lies. But in addition to this, we have a direct interest in the subject. Whatever may be done by that State to stock the Ohio with food fishes will inure to our benefit, almost or as much as to theirs and the efforts of that State will largely fail of success, unless the fish have access to the more favorable spawning streams.

## PROTECTION OF FISH.

Additional legislation is necessary, in our opinion, for the protection of our native fishes and the new varieties with which we have stocked them. As there are many different views as to the best means of accomplishing this object, we do not consider it proper at this time to more than call attention to the matter in this general way.

## ACKNOWLEDGEMENTS.

We desire to return our acknowledgements to Prof. S. F. Baird, the United States Fish Commissioner; to Major T. B. Ferguson, of the Maryland Commission; to Col. James Duffy, of the Pennsylvania Commission; to Prof. Rudolph Hessel, for favors extended to us; and to Vice President Wm. C. Wickham, of the Chesapeake & Ohio railroad, and to Vice President Wm. Keyser, of the Baltimore & Ohio

## ERRATA.

*For Financial Statement of the Treasurer of Board of Fish Commissioners, from August 30th,* 1877, *to November 22d,* 1878, *on page* 25, *substitute the following:*

### DEBIT.

| | |
|---|---|
| To appropriation by act of February 20th, 1877 | $3,000 00 |

### CREDIT.

| | |
|---|---|
| By amount expended by Commissioner Harris for books and stationery | 15.65 |
| " " per Commissioner White on account of hatchery | 700.00 |
| " " " " " on account of expenses of hatchery | 200 00 |
| " " " " " to supply fish to Second District | 300.00 |
| " " " Commissioner Miller to supply fish to First District | 300.00 |
| " " expended by Commissioner Miller for expenses attending two meetings of the Board and inspecting hatcheries and fish-ways in Pennsylvania and Maryland and Greenbrier and New rivers | 147 25 |
| " " expended by Commissioner Harris for same | 124.00 |
| " " expended by Commissioner White for same | 113.00 |
| " " expended by Commissioner Harris for black bass for Greenbrier and New rivers, and expenses of depositing | 188 05 |
| " " expended by same for brook trout and expenses of depositing | 30.50 |
| " " expended by same for telegrams | 5.88 |
| " " expended for transportation of salmon eggs from California | 320.05 |
| " " expended by Commissioner Harris f[illegible] transporting and depositing same in Greenbrier river | 72.63 |
| " " expended by Commissioner Harris, for cans and expressing same | 9.95 |
| Balance on hand November 22, 1878 | 473.04 |
| | 3,000.00 |

railroad, for transportation furnished for fish and messengers. We are also indebted to various parties in this State, for aid extended in procuring and distributing fish.

### *Financial Statement of the Treasurer of Board of Fish Commissioners, From August 30th, 1877, to November 22d, 1878.*

DEBIT.

| | |
|---|---|
| To appropriation by act of February 20th, 1877 | $3,000.00 |

CREDIT.

| | |
|---|---|
| By amount expended by Commissioner Harris in books and stationery | 15 65 |
| “ “ per Commissioner White on account of hatchery | 700.00 |
| “ “ “ “ “ on account of expenses of hatchery | 200 00 |
| “ “ “ “ “ to supply fish to Second District | 300 00 |
| “ “ “ Commissioner Miller to supply fish to First District | 300 00 |
| “ “ expended by Commissioner Miller for expenses attending two meetings of the Board and inspecting hatcheries and fish-ways in Pennsylvania and Maryland and Greenbrier and New rivers | 147 25 |
| “ “ expended by Commissioner Harris for same | 224 00 |
| “ “ expended by Commissioner White for same | 113 00 |
| “ “ expended by Commissioner Harris for black bass for Greenbrier and New rivers and expenses of depositing | 188 00 |
| “ “ expended by same for brook trout and expenses of depositing | 30 50 |
| “ “ expended by same for telegrams | 5 88 |
| “ “ expended for transportation of salmon eggs from California | 320 05 |
| “ “ expended by Commissioner Harris for transporting and depositing same in Greenbrier river | 72 63 |
| “ “ expended by Commissioner Harris, cans and expressing same | 9 95 |
| Balance on hand November 22, 1878 | 473 04 |
| | 3,000.00 |

### *Financial Statement af H. B. Miller, Commissioner of Fishes.*

DEBIT.

| | |
|---|---|
| To amount received from J. W. Harris, Treasurer of Commission | $300 00 |

CREDIT.

| | |
|---|---|
| By amount expended in transporting and planting 10,000 California salmon from Balt., Md. | 42 00 |
| “ “ paid B. F. Caldwell, for five fish cans, &c | 23 00 |
| “ “ exdended depositing L L salmon in Fishing Creek | 12 55 |
| “ “ “ two trips to Parkersburg, arranging to hatch “Jack Salmon” | 36 25 |
| “ “ paid for telegrams from C G Atkins and to C S White | 1 78 |
| “ “ “ “ postage | 5 37 |
| “ “ “ “ L L Salmon, and for transporting and planting same | 110 30 |
| “ “ “ “ planting 100,000 California Salmon, Little Kanawha, Hughes' and West Fork Rivers and Middle Island Creek | 40 90 |
| “ “ “ “ planting 75,000 California Salmon in Fish and Fishing Creeks | 11 85 |
| “ “ “ B. F Caldwell, repairing cans | 1 50 |
| “ “ “ Henry Foster for hatching boxes | 11 59 |
| “ “ “ B. F. Caldwell for tin pans for hatching boxes | 3 00 |
| Total | $300 00 |

### *Financial Statement of C. S, White, Fish Commissioner.*

DEBIT.

| | |
|---|---|
| To amount received of J. W. Harris, Treasurer, to supply fish to the Second District | $300 00 |
| “ “ “ of Treasurer Harris on account of expenses of hatching | 200 00 |
| Total | $500 00 |

CREDIT.

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| The sum of $300 00 above charged was paid to R Brennan, on account of ova purchased of him, as per receipt of his, filed | $300 00 |
| The sum of $200 00 was paid Graham, on account of salary, as per receipt, filed | $200 00 |
| Total | $500 00 |

It will thus be seen that there was in the hands of the Treasurer on the 22d day of November, 1878, the sum of four hundred and seventy-ty-three dollars and four cents.

Against this balance, however, there are certain unaudited claims for the purchase and transportation of ova, expenditures at the hatchery, expenses of the Commissioners, &c., which will consume the whole of it.

In addition thereto, Commissioner White has incurred certain liabilities for the benefit of his own District, which should be provided for out of the share of that District, in any appropriation that may be hereafter made by the Legislature.

Respectfully submitted.

John W. Harris.
H. B. Miller.
C. S. White.

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## COMMISSIONERS OF FISHERIES.

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|---|---|
| *United States.* | |
| Professor Spencer F. Baird | Washington, D. C. |
| *Alabama.* | |
| Charles S. G. Doster | Montgomery. |
| Robert Tyler | Montgomery. |
| D. R. Hudley | Courtland. |
| *Arkansas.* | |
| N. H. Fish | Pine Bluff. |
| J. R Steelman | Little Rock. |
| N. B. Pearce | Fayetteville. |
| *Califorinia.* | |
| B. B. Redding | Sacramento |
| S. R. Throckmorton | San Francisco. |
| J. D. Farwell | San Francisco. |
| *Colorado.* | |
| Wilson E. Sisty | Brookvale. |
| *Connecticut.* | |
| William M. Hudson | Hartford. |
| Robert G. Pike | Middletown. |
| James A. Bill | Lyme. |
| *Georgia.* | |
| Thomas P. James | Atlanta. |
| (Duties embracing the work of the fish interest assigned to Commissioner of Agriculture.) | |
| *Illinois.* | |
| W. A. Pratt | Elgin. |
| *Iowa.* | |
| Samuel B. Evans | Ottumwa. |
| B. F. Shaw | Anamora. |
| Chales A. Haynes | Waterloo. |

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|---|---|
| *Kentucky.* | |
| Pack Thomas | Louisville. |
| P. H. Darsey | Caldwell county. |
| Polk Laffmon | Hopkins county. |
| S. W. Coombs | Warren county. |
| C. J. Walton | Hart county. |
| James B. Casey | Kenton county. |
| John A. Steele | Woodford county. |
| I. H. Bruce | Gerrard county. |
| T. T. Gerrard | Clay county. |
| W. C. Allen. | Bath county. |
| *Maine.* | |
| E. M. Stillwell | Bangor. |
| Henry O. Stanley | Dixfield. |
| *Maryland.* | |
| T. B Ferguson | Baltimore. |
| T. W. Downs | Denton. |
| *Massachusetts.* | |
| Theodore Lyman | Brookline. |
| E. A. Brackett | Winchester. |
| Asa French | South Braintree. |
| *Michigan.* | |
| George Clark | Ecorse. |
| A. J. Kellogg | Allegan. |
| E. R. Miller | Richland. |
| George H. Jerome, superintendent | Niles. |
| H. H. Porter, sup't State hatching house | Pokagon. |
| *Minnesota.* | |
| R. O. Sweeney | St. Paul. |
| A. W. Latham | Excelsior. |
| Horace Austin | St. Paul. |
| *New Hampshire.* | |
| Samuel Webber | Manchester. |
| Luther Hayes | Milton. |
| Albina H Powers | Grantham. |
| *New Jersey.* | |
| B. P. Howell | Woodbury. |
| J. R. Shortwell | Rahway. |
| G. A. Anderson | Trenton. |
| *New York.* | |
| Horatio Seymour | Utica. |
| Robert B. Roosevelt | New York City. |
| Edward M. Smith | Rochester. |
| Seth Green, superintendent | Rochester. |
| *North Carolina.* | |
| Gov. Z. B. Vance | Raleigh. |
| Prof. W. C. Kew | Raleigh. |
| Prest. R. P. Battle | Chapel Hill. |
| Col. S. M Holt | Haw River. |
| Capt S. B. Alexander | Charlotte. |
| Maj. Jonathan Evans | Fayetteville. |
| Capt. J. R. Trispan | Tarboro. |

*Nevada.*

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| H. G. Parker | |

*Ohio.*

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| John C. Fisher | Coshocton. |
| John A. Klippart | Columbus. |
| Robert Cummings | Toledo. |
| E. D. Porter, superintendent | Toledo. |

*Pennsylvania.*

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| H. J. Reeder | Easton. |
| B. L. Hewit | Hollidaysburg. |
| James Duffy | Marietta. |

*Rhode Island.*

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|---|---|
| Newton Dexter | Providence. |
| Alfred A. Reed, Jr. | Providence. |
| John H. Barden | Scituate. |

*Utah Territory.*

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|---|---|
| A. P. Rockwood<br>(Superintendent of Fisheries, Zion's Co-cooperative Society.) | Salt Lake City. |

*Vermont.*

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| M. Goldsmith | Rutland. |
| Charles Barrett | Grafton. |

*Virginia.*

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|---|---|
| Col. Marshall McDonald | Lexington. |

*West Virginia.*

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|---|---|
| Henry B. Miller | Wheeling. |
| C. S. White | Romney. |
| Jno. W. Harris | Lewisburg. |

*Wisconsin.*

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|---|---|
| Gov. Harrison Luddington | Milwaukee. |
| William Welch | Madison. |
| A Palmer | Boscobal. |
| P. R. Hoy | Racine. |
| H. F. Douseman | Waterville. |

*Dominion of Canada.*

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|---|---|
| W. F. Whitcher | Ottawa. |
| W. H. Venning<br>Inspector of Fisheries for New Brunswick. | St. John, N. B |
| P. S. Hamilton<br>Inspector of Fisheries for Nova Scotia. | |
| Samuel Wilmot<br>Fishery Officer. | Ottawa. |